BIG

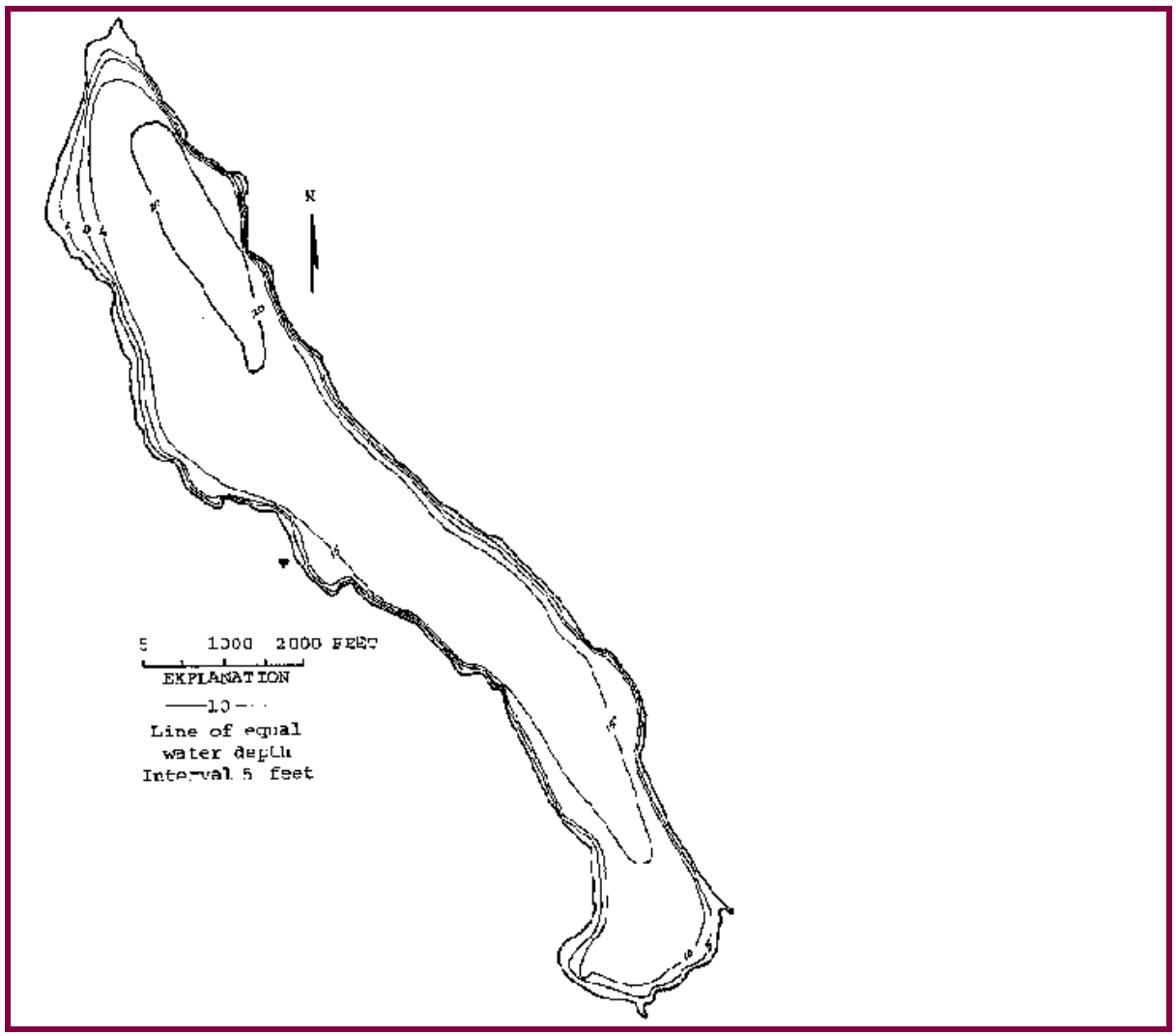
SKAGIT County

Lake ID: *BIGSK1*

Ecoregion: 2

Big Lake is located five miles southeast from Mount Vernon and about twenty five miles south from Bellingham. It is fed by several inflows, the largest, Lake Creek, comes from McMurray Lake. Six additional unnamed tributaries are located along the western shore. It drains to the Skagit River via Nookachamps Creek. The lake is shallow with abundant plant and algal growth and is a popular water body for personal watercraft.

Area (acres)	*Maximum Depth (ft)*	*Mean Depth (ft)*	*Drainage (sq mi)*	
520	23	14	22	
Volume (ac-ft)	***Shoreline (miles)***	***Altitude (ft abv msl)***	***Latitude***	***Longitude***
7470	6.21	81	48 23 52.	122 14 24.



Station Information

BIGSK1

Primary Station	Station # 1	latitude: 48 23 15.9	longitude: 122 14 04.9
	Description:	Deep part of lake. Directly north of boat launch, about 500 feet west of shore.	

Trophic State Assessment for 1999

BIG

Analyst: Sarah O'Neal

TSI_Secchi:	[a]	44
TSI_Phos:		46
TSI_Chl:		50
Narrative TSI:	[b]	M

Big Lake is shallow, with abundant plant and algal growth. Despite its productivity, plants grew less densely than expected, and algal blooms were subtle enough to prevent detracting from the aesthetic value of the lake. The lake underwent Sonar treatment in the summer of 1998 to combat the invasive, non-native aquatic plants, Brazilian elodea (Egeria densa) and Eurasian watermilfoil (Myriophyllum spicatum). The treatment drastically reduced, if not eliminated, the milfoil and affected the Brazilian elodea, though not as significantly as hoped. A second sonar treatment was being considered for the summer of 2000. The lake experienced a steady decline in transparency through the summer, as indicated by Secchi readings. Shallow depths in the lake prevented thermal stratification, however, dissolved oxygen levels dropped off sharply near the bottom. We recorded one high fecal count in August near the public boat launch. The source of contamination is unknown. Possible sources include agriculture, stormwater runoff, goose and animal access, and swimmers. Popular activities on the lake included skiing and the use of personal watercraft. Most questionnaire respondents, however, were primarily interested in fishing. Survey respondents indicated a strong desire for restrictions on popular motorized activities. Visitors enjoyed warmwater fishing, particularly for largemouth bass. According to Washington Department of Fish and Wildlife (WDFW), yellow perch, large-scale suckers, and brown bullhead were also abundant in the lake. Coldwater fish species declined dramatically since the last evaluation in 1978, although cutthroat trout and coho salmon utilized the lake at very low densities. A considerably lower percentage of large zooplankton in September than in June indicated heavy predation by planktivores. This suggests that population of piscivores may be too small to suppress planktivore density.

Shallow depths, dense residential development, and a location in a relatively large watershed may render Big Lake particularly susceptible to (and may have already caused) human-caused eutrophication. In 1999, however, the water quality was supporting the lake's primary uses, fishing and primary contact recreation. The mean measured total phosphorous concentration for Big Lake was 18.7. Pending a more thorough study, we recommend a tentative total phosphorus criterion of 20 ug/L, the action value for Puget Lowlands lower mesotrophic lakes. Future studies will likely recommend lowering this criterion.

Time-weighted means: Secchi = 3.1 m; TP = 18.7 ug/L; Chl = 7.6 ug/L

[a] TSI Qualifiers: B or W-Secchi Disk hit bottow or entered weeds; J-Estimate; N-Fewer than the required number of samples

[b] E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

BIG

Date	Time	Strata	Tot P (ug/L	Tot N (mg/L)	TN:TP	Chloro-phyll (ug/L)	Fecal Col. Bacteria (#/100mL)	Hardness (mg/L)	Calcium (ug/L)	Turbidity (NTU)
Station 0										
6/9/1999		L					6			
		L					24			
8/9/1999		L					45			
		L					270 J			
9/8/1999		L					3			
		L					1 U			
Station 1										
6/9/1999		E	16.1	.363	23	5		28.7	5850	.8
7/15/1999		E	14.1	.305	22	7.24				1.2
		H	20.1	.342	17					
8/9/1999		E	17.4	.289	17	4.1				1.6
9/8/1999		E	24.2	.303	13	11.7				2.3

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than, G=Greater than.

Watershed Survey

BIG

Survey Date: 9/8/1999

Land Uses (1 = Primary, 2 = Secondary, etc.)

- [2] **Agriculture(commercial, not hobby)**
- [ ] **Commercial, Industrial**
- [ ] **Major transportation**
- [1] **Residential**
- [3] **Park, forest or natural**

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

Poor. No buffers--grass runs to shoreline.

Odors ☐

None noted.

Cattle ☐ **Ducks** ☑ **Geese** ☐

One duck by outlet.

Fertilizers and weed killers appear to be used in residential or agriculture area ☑

Residences on the shoreline.

Buffer zones around streams and wetlands ☑

Poor at best. Lawns run to edge of shore.

Irrigation ☐

None noted

Survey Id: 50

Habitat Survey Summary Report

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Data are averages of ***10*** **Stations Surveyed** **Date of Visit:** 9/15/1999

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

Canopy Layer Avg:	1.7	**Number of stations with canopy:**	9
Understory Avg:	2.6	**Number of stations with understory:**	10

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

Canopy Layer:	**trees > 0.3 m DBH**	1.7
	trees< 0.3 m DBH	0.5
Understory:	**woody shrubs saplings**	2.1
	tall herbs, forbs grasses	0.6
Ground Cover:	**woody shrubs seedlings**	1.3
	herbs, forbs, grasses	3.1
	standing water or inundated veg	0.0
	barren or buildings	2.3
Substrate Type (within shoreline plot):	**bedrock**	0.2
	boulders	0.3
	cobble/gravel	2.2
	loose sand	0.2
	other fine soil/sediment	0.2
	vegetated	2.4
	other	0.6

Bank Features:	**angle (O:<30; 1: 30-75; 2:nr vertical)**	0.3
	vertical dist (M from wtrln to high wt):	0.3
	horiz. dist. (M from wtrln to high wt):	0.3

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)

buildings	1.7
commercial	0.0
park facilities	0.2
docks/boats	1.4
walls, dikes, or revetments	1.4
litter, trash dump, or landfill	0.0
roads or railroad	0.0
row crops	0.0
pasture or hayfield	0.0
orchard	0.0
lawn	1.9
other	0.0

Physical Habitat Characteristics

station depth (m; at 10 m from shore)	2.0

Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

bedrock	0.1
boulders	0.1
cobble	0.5
gravel	1.0
sand	1.6
silt	2.7
woody debris	0.1

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

submergent	2.8
emergent	0.9
floating	1.1
total weed cover	3.2
Do macrophytes extend lakeward (-1 = yes, 0 = no)	-0.8

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

aquatic weeds	2.0
snags	0.0
brush or woody debris	0.0
inundated live trees	0.0
overhanging vegetation	0.2
rock ledges or sharp dropoffs	0.3

boulders	0.1
human structures	0.8

Questionnaire

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Results compiled from 5 **Surveys.** **Average time (years) respondents spent on lake:** 10.00

Did the following add (+1), detract (-1), or have no effect (0) on your enjoyment of the lake today?

Types of WaterCraft:	-0.7	View:	0.8	Distance to Lake:	0.3
Public Access:	0.5	Swim Beach:	0.0	Canada Geese:	-0.5
Water Clarity:	0.7	Water Qual. for Swim:	0.3		
Fishing Quality:	1.0	Aquatic Plants:	0.3		

On a scale of 1 (poor) to 5 (excellent), how would you rate water quality today? **3.6**

Which would you rather have, 1 or 2?

1) Better fishing and more natural habitat, or 2) clearer water?	1.2
1) Better fishing and more natural habitat, or 2) fewer aquatic plants?	1.2
1) Clearer water, or 2) fewer aquatic plants?	1.3

How important is each of the following characteristics to you (1 = very undesirable, 5= very desirable):

Restricted Watercraft:	4.0	Good Warmwtr Fishing:	4.8	Natural Scenery:	4.2
Plant Growth:	3.0	Good Swimming:	3.2	Public Beach:	3.0
Natural Shoreline:	3.4	Less Algae:	4.0	Canada Geese:	2.8
No Odors:	4.0	Public Access:	4.4		
Good Coldwtr Fishing:	3.4	Clear Water:	3.8		

Tabulated Results

Survey ID	Date	Residency	Rent or Own	Primary Activity*	Water Clarity: Purchase Factor?	Water Clarity: Has it Changed?	Water Clarity: When?
100	9/11/1999	Visitor		2	☐	Better	
101	9/8/1999	Visitor		2	☐	No	
	Jet skiis and water skiers should be restricted from the south and north bays of the lake which is good fishing. The main lake has enough room for their use.						
109	9/8/1999	Visitor		4	☐	Unknown	
137	6/15/1999	Visitor		2	☐	No	
210	7/15/1999	Visitor		2	☐	Worse	90
	Better access						

* 1=canoe/kayak, 2=fish, 3=pers. wtrcrft, 4=mtrboat, 5=sail, 6=swim/wade, 7=watch wldlf, 8=ski, 9=windsurf, 10=relaxing

Zooplankton Report

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Date 6/9/1999 Station: 1 Sample ID 75

Length of tow not labelled. About .5 mLs measured. Dense algae, and a few rotifers.

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.87

Date 8/9/1999 Station: 1 Sample ID 50

Site number and length of tow not labelled.

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.82

Aquatic Plant Data

BIG

Sampler: Parsons, O'Neal

Survey Date: 9/15/1999

Max depth of growth (M): 3

Comments Foggy, breezy. Sonar treatment 7/1/98. Dense Egeria at south end and patches in other parts of the lake, looks like it will dominate again soon. Now a foot or so below the surface. Shoreline very developed. Many water fowl, including domestic geese and ducks. No M. spicatum observed. Did habitat survey.

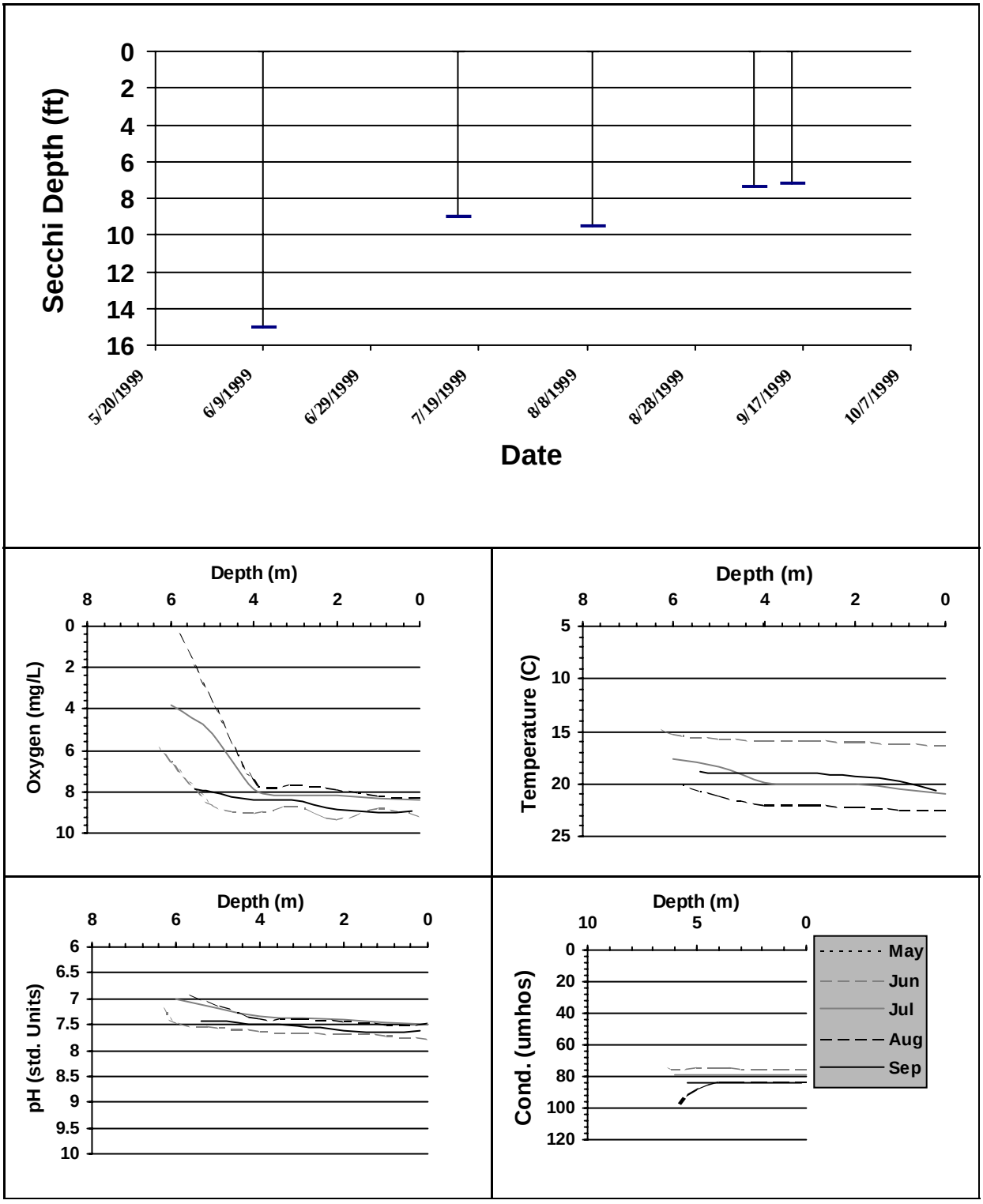
SPECIES LIST

Scientific Name	Common Name	Dist [a]	Comments
Brasenia schreberi	watershield	2	
Ceratophyllum demersum	Coontail; hornwort	2	
Chara sp.	muskwort	2	
Egeria densa	Brazilian elodea	4	dominant at south end and patches elsewhere
Elodea canadensis	common elodea	2	
Equisetum sp.	horse tail	2	at south end
Iris pseudacorus	yellow flag	2	
Najas flexilis	common naiad	2	
Nitella sp.	stonewort	1	
Nuphar polysepala	spatter-dock, yellow water-lily	2	
Nymphaea odorata	fragrant waterlily	2	
Phalaris arundinacia	reed canarygrass	2	
Potamogeton epihydrus	ribbonleaf pondweed	3	most common pondweed
Potamogeton richardsonii	Richardson's pondweed	2	
Potamogeton sp (thin leaved)	thin leaved pondweed	2	
Potamogeton zosteriformis	eel-grass pondweed	1	
Scirpus sp.	bulrush	2	
Tolypella intricata	macro algae	2	
Typha latifolia	common cat-tail	2	
Vallisneria americana	water celery	3	

[a] 0 - value not recorded (plant may not be submersed)
1 - few plants in only 1 or a few locations
2 - few plants, but with a wide patchy distribution
3 - plants in large patches, codominant with other plants
4 - plants in nearly monospecific patches, dominant
5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1 BIGSK1



Secchi Data and Field Observations

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Date	Time	Temp-erature (F)	Secchi (ft)	Color (1-greens, 11-browns	Bright-ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5-good)	Swimming (1-poor, 5-good)	Geese (#)	Waterfowl (besides geese #)	Boats-Fishing (#)	Boats-Skiing (#)
Station 1													
6/9/1999			15.09	2	50	1		5	4	0	0	1	
	Sampler: SMITH			Remarks:	Slight algae bloom. Water very calm. Lots of large daphnia. Dissolved oxygen measurement qualified as an estimate due to calibration failing QA/QC requirements.								
7/15/1999			9.02	6	50	3		4	4	27	19	1	1
	Sampler: SMITH			Remarks:	Sample site is directly east of white condo just 150 meters off east shore. Small algal bloom (blue-green). Water unusually clear for July.								
8/9/1999			9.51	6	20	1	1	4	4	0	27	1	1
	Sampler: SMITH			Remarks:	Fec #1 at Big Lake Resort; Fec #2 at Public boat launch.								
9/8/1999			7.4	2	0	1	1	3	3	0	2	1	2
	Sampler: SMITH			Remarks:	Sample site right off Big Lake Resort. A considerable blue-green bloom. Fec #1 near north end of lake on west side near a new dock approx. 300 yds from outlet.								
9/15/1999			7.22										
	Sampler: Parsons			Remarks:									